DRAFT
Air Quality Monitoring Work Plan
for the Yerington Mine Site

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SECTION 1.0
INTRODUCTION

Air quality monitoring will be conducted by Atlantic Richfield Company at the Yerington Mine to support an evaluation of the potential risk to human health and the environment that may result from fugitive dust generated by mine surface units and process areas. Fugitive dust emissions from the mine will be evaluated for one year using strategically-placed air quality monitoring stations at the perimeter of the site. For particulate matter, monitoring results will be evaluated in the context of National Ambient Air Quality Standards (NAAQS). The following Work Plan was developed in concert with EPA's contractor (Tetra Tech / EMI) and describes the monitoring locations and equipment, sampling specifications, analytical methods, quality assurance program, data management, reporting, and schedule.

SECTION 2.0
MONITORING LOCATIONS AND EQUIPMENT

Air quality monitoring will be conducted at six locations near the perimeter of the site as shown on Figure 1. All locations will monitor particulate matter with a diameter of 10 microns or less (PM_{10}) with a high volume air sampler and total suspended particulates (TSP) with a separate high volume air sampler. Location AM-1 will have a secondary PM_{10} high volume air sampler co-located with the primary sampler for duplicate analysis. An existing meteorological (met) station is proximate to location AM-6. A summary of the equipment and approximate coordinates for each monitoring location are provided in Table 1.

Table 1 Monitoring Locations and Equipment

Location	Equipment	Latitude	Longitude
AM-1	PM_{10} high volume samplers (primary and co-located duplicate) and TSP high volume sampler	38° 59.678	119° 12.737
AM-2	PM_{10} high volume sample and TSP high volume sampler	39° 00.535	119° 13.197
AM-3	PM_{10} and TSP high volume samplers	38° 59.885	119° 11.581
AM-4	PM_{10} and TSP high volume samplers	39° 00.722	119° 11.007
AM-5	PM_{10} and TSP high volume samplers	39° 01.126	119° 11.958
AM-6	PM_{10} and TSP high volume samplers	39° 01.476	119° 12.204
--	Meteorological station	39° 01.477	119° 12.267

Coordinates are approximate

Construction of the six monitoring locations would begin in December 2004. Each monitoring location will be serviced with permanent electrical supply and the equipment will be secured to a 3 foot by 3 foot by 3 inch concrete pad. The monitoring locations and placement of the equipment will comply with criteria specified in 40 CFR 58 Appendix E Section 8 including appropriate vertical placement and spacing from roads and obstructions. For security purposes, chain link fencing would be constructed around each air quality sampler pending EPA approval.

The met station was installed at the Yerington Mine between May 1 and 6, 2002 and has been operational since May 7, 2002. The station is located adjacent to PW06 (pumpback well number 6) at the northern margin of the mine site.

2.1 High Volume Air Sampling Equipment

Tisch Environmental, Inc. manufactures the high volume air sampling equipment to be used in this program and has received approval from the EPA under Federal Reference Method Number RFPS-0202-141. The PM_{10} and TSP high volume air sampler specifications are summarized in Table 2 and described in the following sections.

Table 2. High Volume Air Sampler Specifications

Type	PM_{10}	TSP
Manufacturer	Tisch Environmental, Inc.	Tisch Environmental, Inc.
Model	TE-6070D	TE-5170-D
Construction	anodized aluminum	anodized aluminum
Inlet	size selective, vertically symmetric	n/a
Flow Rate	36 to 44 ft^3/min	39 to 60 ft^3/min
Flow Control	mass flow controlled w/ probe	mass flow controlled w/ probe
Motor Blower	2-stage vacuum, 0.6 hp	2-stage vacuum, 0.6 hp
Flow Indicator	continuous flow/pressure recorder	continuous flow/pressure recorder
Timer	digital timer/elapsed time indicator	digital timer/elapsed time indicator
Electrical supply	110 V, 60 Hz, 5 A (12 A start)	110 V, 60 Hz, 6 A (12 A start)

2.1.2 PM_{10} High Volume Sampler

The TE-6070D is a mass flow controlled high volume air sampler for measurement of PM_{10}. The system components are housed in an anodized aluminum shelter that supports a size selective, vertically symmetric PM_{10} inlet. A blower motor assembly draws air through the 8 inch by 10 inch quartz fiber filter which is held in place by a filter paper cartridge. A combination mass flow controller with air flow probe, digital timer, and digital elapsed time indicator provides a constant flow rate and programmable operation. A continuous flow/pressure recorder verifies the sample duration and ensures the target volume is achieved. Photographs of the TE-6070D and system components are provided in Appendix A.

2.2.2 TSP High Volume Sampler

The TE-5170D is a mass flow controlled high volume air sampler for measurement of TSP. The system components are housed in an anodized aluminum shelter with a gabled roof. A blower motor assembly draws air through the 8 inch by 10 inch quartz fiber filter which is held in place by a filter paper cartridge. A combination mass flow controller with air flow probe, digital timer, and digital elapsed time indicator provides a constant flow rate and programmable operation. A

continuous flow/pressure recorder verifies the sample duration and ensures the target volume is achieved. A photograph of the TE-5170D is provided in Appendix B. The system components in the TE-5170D are nearly identical to those in the TE-6070D.

2.2 Meteorological Station

The met station is equipped with instruments for recording air temperature, relative humidity, precipitation, solar radiation, wind speed, and wind direction. The data logger attached to the instruments is currently programmed to sample every 2 seconds and write data every 10 minutes and at 24 hours. Depending upon the desired data output, the data output program can be modified. The instruments attached to the station include:

- One CR10X control system and data logger
- One 12 V charger and regulator
- One 18 V 1.2 A wall transformer with 6 foot cord
- One 12AH sealed rechargeable battery with mounting
- One 16" by 18" weatherproof enclosure with one conduit
- One 10 foot tripod with grounding kit
- One RM Young 05305 Wind Monitor-AQ for recording wind speed and direction. This model is specifically designed for air quality measurements and according to Campbell Scientific, meets or exceeds requirements published by the EPA. The instrument is rated for wind speeds between 0 to 90 miles/hour and single gusts of 100 miles/hour.
- 12-feet of WIR CA 24AWG 3TWST PR santoprene jacket
- One aluminum crossarm sensor mount
- One Vaisala temperature/RH probe
- 6-feet of WIR CA 24AWG 3TWST PR santoprene jacket
- One RM Young 12 plate gill solar radiation shield for temperature and RH probe
- One Kipp & Zonen silicon pyranometer. This instrument is typically used in solar radiation applications such as plant growth and evapotranspiration investigations. It is mounted on the south crossarm and is unobstructed.
- 12-feet of WIR CA 22AWG 1TWST PR santoprene jacket
- One Kipp & Zonen base and leveling fixture for pyranometer
- One pyranometer crossarm stand
- One Texas Electronics 8" rain gage 0.01 tip
- 35 feet of WIR CA 22AWG 1TWST PR santoprene jacket
- One tipping bucket CS705 snowfall adapter with antifreeze
- One RS-232 Interface and serial cable for downloading data

- One copy of PC208W data logger programming software

Primary power to charge the 12 V battery is supplied from the line that supplies pumpback well PW06. The met station equipment is mounted to a CM10 tripod with a nominal height of 10 feet. The base diameter of the tripod is about 10 feet and does not obstruct access to well PW06. The leg configuration of the tripod is adjustable for uneven terrain and has been adequately leveled according to the manufacture specifications. The unit is designed to withstand a sustained wind of 70 miles per hour (mph) and gusts of 100 mph. Three 2-foot rebar stakes hold the station in place and one of the stakes is cemented into the ground. Photographs of the met station are provided in Appendix C.

SECTION 3.0
SAMPLING SPECIFICATIONS

Sampling will be conducted in accordance with 40 CFR, Chapter 1, Appendix J to Part 50, *Reference Method for the Determination of Particulate Matter as PM-10 in the Atmosphere*. The monitoring will involve collecting an integrated (i.e., continuous) 24-hour air sample from midnight to midnight on the target day. Targeted values for sample duration, flow rate, and volume for both PM_{10} and TSP samples are provided in Table 3. The table also includes parameter variances that are allowed by the PM_{10} and TSP methods.

Table 3. PM_{10} and TSP Sample Specifications

Parameter		PM_{10}	TSP
Sample Duration	Target	1,440 min	1,440 min
	Allowable variance	1,380 to 1,500 min	1,380 to 1,500 min
Sample Flow Rate	Target	40 ft^3/min (1.13 m^3/min)	59 ft^3/min (1.67 m^3/min)
	Allowable variance	36 to 44 ft^3/min (1.02 to 1.24 m^3/min)	39 to 60 ft^3/min (1.10 to 1.70 m^3/min)
Sample Volume	Target	57,600 ft^3 (1,630 m^3)	84,750 ft^3 (2,400 m^3)

Although the monitoring equipment has a digital timer and mass flow controller, actual sample duration and flow rate may differ from targeted values. The actual detection limits achieved are dependent upon the instrument detection limit and sample volume (e.g., sample volumes less than targeted values result in higher than targeted detection limits).

SECTION 4.0
PROPOSED ANALYTICAL METHODS

Proposed analytical methods and associated information including target detection limit, sample hold time, and sample media (i.e., filters) are summarized in Table 4 for parameters that may be analyzed under this Work Plan. The actual parameters and analytical methods to be used in the air quality monitoring program are being negotiated, and will be finalized in a separate letter addendum.

Table 4. Proposed Analytical Methods

Analysis	Method	Targeted Detection Limit	Sample Hold Time	Sample Media
PM_{10}	EPA IO-2.1	+/- 5 µg/m^3	6 months	8" x 10" quartz fiber filter
Thorium (228, 230, 232)	HASL-300	4.2 E-04 pCi/m^3	6 months	8" x 10" quartz fiber filter
Radium 226	EPA 903.1M	4.2 E-04 pCi/m^3	6 months	
Radium 228(b)	EPA 904.0M	6.5 E-03 pCi/m^3	6 months	
Gross Alpha	HASL-300	8.3 E-03 pCi/m^3	6 months	
Gross Beta	HASL-300	2.5 E-04 pCi/m^3	6 months	
Uranium (234, 235, 238)	HASL-300	4.2 E-04 pCi/m^3	6 months	
Arsenic	SW846-6020/6010B	0.07 µg/m^3	6 months	
Barium	SW846-6020/6010B	0.28 µg/m^3	6 months	
Cadmium	SW846-6020/6010B	0.07 µg/m^3	6 months	
Chromium	SW846-6020/6010B	0.07 µg/m^3	6 months	
Lead	SW846-6020/6010B	0.07 µg/m^3	6 months	
Mercury	SW846-7471A	0.0014 µg/m^3	28 days	
Selenium	SW846-6020/6010B	0.35 µg/m^3	6 months	
Silver	SW846-6020/6010B	0.07 µg/m^3	6 months	

HASL = Methods from *Environmental Measurements Laboratory (EML) Procedures Manual*, 27th Edition, November 1990

EPA = Methods from *EPA-600, Prescribed Procedures for Measurement for Radioactivity in Drinking Water*, August 1990

SW = *USEPA Test Methods for Evaluating Solid Wastes, SW-846*, 3rd Edition

SECTION 5.0
QUALITY ASSURANCE PLAN

The quality assurance program is based on requirements specified in the *Quality Assurance Project Plan, Yerington Mine Site* (QAPP) dated September 19, 2003. The program incorporates the following items: standard operating procedures (SOPs), equipment calibration and maintenance, independent audit, field quality control (QC) samples, certified laboratory, laboratory QC samples, data validation, and corrective action.

5.1 Standard Operating Procedures

Sampling, calibration, and maintenance will be conducted in accordance with SOPs provided in the QAPP and by the equipment manufacturer. The SOP for operation of the PM_{10} high volume air sampler is provided in Appendix D. This SOP includes detailed instructions on sampler operation, digital timer operation, and total sample volume calculations. The SOP for operation of the TSP high volume air sampler is provided in Appendix E. This SOP includes detailed instructions on sampler operation. Instructions for digital timer operation and total sample volume calculations are the same as for both the PM_{10} and TSP air sampling equipment. SOPs for equipment calibration and maintenance are discussed in the following sections.

5.2 Equipment Calibration

Equipment calibration for the high volume air samplers and met station will be performed according to the manufacturer as described below. This section also describes the calibration report that will be included in the quarterly and annual reports (refer to Section 7.0).

5.2.1 High Volume Air Samplers

Calibration of the PM_{10} and TSP air sampling equipment will be performed by Brown and Caldwell. The manufacturer recommends the equipment be calibrated according to the following schedule:

- Upon installation;
- After any motor maintenance;
- Once every quarter (3 months); and
- After 360 sampling hours.

The same calibration SOP is used for both the PM_{10} and TSP high volume air samplers and is provided in Appendix F. The air sampling equipment will be calibrated with the Tisch Environmental, Inc. variable resistance calibration kit. The kit includes a variable orifice, NIST traceable calibration certificate, adapter plate, slack tube manometer, and tubing. In addition to following the calibration procedures specified in the SOPs, the following calibration criteria must be met:

- Minimum of five calibration points;
- Three calibration points within the allowable variance range (e.g., for PM_{10}, three points must be within 36 to 44 ft^3/min); and
- Correlation coefficient greater than 0.990.

5.2.2 Meteorological Station

Calibration of the met station will be performed by a qualified third party at the start of the program and on a semi-annual basis thereafter.

5.2.3 Calibration Report

The calibration of the high volume air samplers and met station will be included in the quarterly and annual reports. The information listed below will be provided in the calibration report.

- Calibration summary
- Calibration methods
  - PM_{10} high volume samplers
  - TSP high volume samplers
  - Met station
- Calibration equipment
- Calibration results and comments

5.3 Equipment Maintenance

Maintenance for the PM_{10} and TSP air sampling equipment and met station will be performed by Brown and Caldwell according to the manufacturer. Equipment maintenance for the PM_{10} and TSP high volume air samplers is provided in Appendix G and consists of routine maintenance, motor brush replacement, and troubleshooting/corrective action. The manufacturer recommends checking or replacing motor brushes every 300 to 500 hours of operation. Meteorological station equipment is provided in Appendix H.

5.4 Independent Audit

The EPA may choose to conduct an independent audit of the high volume air samplers and meteorological station to verify calibration and operation.

5.5 Field QC Samples

Field QC samples consist of 10% duplicates, 5% trip blanks, and 5% equipment blanks. The duplicate samples will be collected by co-locating a second PM_{10} sampler at location AM-1. Trip and equipment blanks will be initiated by requiring the laboratory to supply all media (i.e., filters). Trip blanks will be collected by simply returning a filter without taking it out of the protective sleeve. Trip blanks will accompany samples during shipment to and from the site. Equipment blanks will be collected by placing the filter in the sample holder, but not operating the sampler. The filter will then be replaced into the protective sleeve and returned to the laboratory with the samples for analysis. Trip and equipment blanks will be submitted blind to the laboratory.

A sampling and analysis plan (SAP) that lists primary and field QC samples is provided in Appendix I. The SAP lists the proposed sample dates, general type of analysis, primary samples, and field QC samples. There are a total of 61 sampling events and the sample dates are based on the NAAQS monitoring schedule for PM_{10} (refer to Section 8.0). Twelve primary samples are generated during each sampling event resulting in a total of 732 primary samples. The table identifies the locations and events for field QC samples that are in addition to the primary samples. Sixty-one duplicate PM_{10} samples will be collected at AM-1 as described above. Thirty seven trip blanks and 37 equipment blanks will be collected at locations and during events that were assigned randomly using Minitab statistical software.

5.6 Certified Laboratory

The analyses will be performed by Severn Trent Laboratories (STL) at their Richland, Washington and Sacramento, California locations. STL has current certifications from the Nevada Division of Environmental Protection (NDEP) and the National Environmental Laboratory Accreditation Program (NELAP) provided in Appendix J.

5.7 Laboratory Quality Control Samples

Laboratory QC samples consist of method blanks, laboratory control sample (LCS) or blank spike, and sample duplicates for applicable methods.

5.8 Data Validation

The laboratory will provide a standard data package for all samples and a comprehensive validation package for 10% of all samples. Brown and Caldwell will conduct data verification for 100% of all samples using the standard data package. Data verification will be performed on the air monitoring data according to the criteria provided in Appendix K. Data verification will be performed on the meteorological data according to the criteria provided in Appendix L. An independent third party will conduct data validation on 10% of all samples using the comprehensive validation package.

5.9 Corrective Action

In the event of error or omission during the execution of this air quality monitoring program, a corrective action procedure will be implemented. The procedure begins with prompt notification to the Project Manager, an investigation into the cause and effect of the incident, implementation of the corrective action, and submittal of a corrective action letter to the lead agency. The letter will describe the incident, investigation results, and corrective action taken.

SECTION 6.0
DATA MANAGEMENT

Data management components consist of data acquisition, data entry, and the database. Data acquisition will consist of a field data sheet to record high volume air sampler parameters, electronic download of meteorological data, and laboratory submission of electronic data deliverables (EDD) for analytical results. Information from the field data sheet will be hand entered into the database. Downloads of meteorological data occur once every three weeks. Meteorological data downloads and EDDs will be loaded into the database with automatic data loading programs. The data will be stored in a Microsoft SQL Server relational database and retrieved and queried with a Microsoft Access graphical user interface.

SECTION 7.0
REPORTING

Reporting will consist of three quarterly reports, one annual report, and electronic data submittal as described below.

Quarterly Report

The quarterly report will be a brief letter report that summarizes the monitoring activities during the quarter, data collected, results of calibration, and maintenance performed. Tables will summarize the analytical results by monitoring event and average meteorological conditions by month. Appendices will provide field data sheets, the calibration report, analytical laboratory reports, and data verification results. The quarterly report will be submitted final to the lead agency.

Annual Report

The annual report will present the information provided in a quarterly report, summarize the activities of the entire monitoring period, present an interpretation of the results, and provide conclusions and recommendations. Tables and appendices will be similar to those included in the quarterly report. The annual report will be submitted draft final to the lead agency for comment. Upon receiving and incorporating comments from the lead agency, a final report will be delivered.

Electronic Data Submittal

Electronic copies of the monitoring data in Microsoft Excel format will be provided to the lead agency with the quarterly and annual reports.

SECTION 8.0
SCHEDULE

The schedule for air quality monitoring would be conducted in accordance with the NAAQS monitoring schedule for PM_{10}. Monitoring would be conducted every sixth day commencing in the first quarter of 2005 and ending four quarters later for a total of 61 events. The monitoring start date is contingent upon agency approval, weather conditions and permanent electrical service installation. The turn around time for analytical results would be 14 calendar days for PM_{10} and 28 calendar days for all other analyses. Quarterly monitoring reports would be delivered to the lead agency by the 21st day of the second month following the completion of the quarter. The draft final annual report would be delivered to the lead agency by the 21st day of the second month following the completion of sampling. The final annual report would be delivered 30 days following receipt of lead agency comments on the draft final.